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FISHER WAYLAND COOPER LEADER & ZARAGOZA L.L.P.
2001 PENNSYLVANIA AVENUE, N.W.
SUITE 400
WASHINGTON, D. C. 20006-1851
TELEPHONE (202) 659-3494

ELIOT J. GREENWALD
(202) 775-3540

FACSIMILE
(202) 296-6518

INTERNET
egreenwald@fwclz.com

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January 16, 1997

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

BY HAND DELIVERY

William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, N.W., Room 222
Washington, DC 20057

Re: GN Docket No. 96-228 - Notice of Ex Parte Meetings

Dear Mr. Caton:

On January 13, 1997, two ex parte meetings were held between representatives of DigiVox Corporation ("DigiVox") and the Commission staff as listed below:

1. Kathleen O'Brian Ham, Chief, Auctions Division
   Jonathan V. Cohen, Auctions Division (on detail)
   Walter D. Strack, Policy Division, Wireless Telecommunications Bureau
   Evan R. Kwerel, Office of Plans and Policy
   John R. Williams, Office of Plans and Policy
   John Prawat, President and Chief Executive Officer of DigiVox
   Eliot J. Greenwald, Fisher Wayland Cooper Leader & Zaragoza L.L.P. ("Fisher Wayland"), representing DigiVox
   Ronald M. Harstad, Ph.D., Economist representing DigiVox
   Simon T. Y. Kim, Hainbok International Management Consulting, representing potential investors in DigiVox

2. Catherine Sandoval, Director, Office of Communications Business Opportunities
   S. Jenell Trigg, Office of Communications Business Opportunities
   John Prawat, President and Chief Executive Officer of DigiVox
   Eliot J. Greenwald, Fisher Wayland, representing DigiVox
   Ronald M. Harstad, Ph.D., Economist representing DigiVox

On January 14, 1997, the Office of Communications Business Opportunities ("OCB") and the Wireless Telecommunications Bureau ("WTB") sponsored a meeting of these

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representing small business interests. Those attending included Catherine Sandoval, Director, OCB, Eric Jensen, Deputy Director, OCB, S. Jenell Trigg, OCB, Jonathan V. Cohen, Auctions Division (on detail), others from the WTB, David W. Zesiger, Assistant Chief Counsel, Office of Advocacy, U.S. Small Business Administration, John Prawat, President and Chief Executive Officer of DigiVox, Eliot J. Greenwald, Fisher Wayland, representing DigiVox, Alan R. Shark, President, American Mobile Telecommunications Association ("AMTA"), Jill M. Lyon, Director, Regulatory Affairs, AMTA, David A. Irwin, Irwin, Campbell & Tannenwald, P.C., Caressa D. Bennet, Bennet & Bennet, PLLC, Terry Schmitz, Piper & Marbury, L.L.P., representing Omnipoint Corporation and other representatives of small business interests.

This letter summarizes the meetings held on January 13, 1997 and the positions taken by DigiVox at the meeting held on January 14, 1997. It does not summarize or explain the positions taken by other representatives of small business interests at the January 14, 1997 meeting.

Auction Schedule

DigiVox emphasized that its most important concern was having sufficient time between the release of the report and order and the upfront payment deadline in order to revise its business plan to conform to the new rules and finalize arrangements with its investors. Ninety days is the optimum time period, although seventy-five to eighty days is workable. DigiVox discussed its proposed time table on page 6 of its opening comments. In particular, DigiVox proposed that the Forms 175 be due on April 15, upfront payments be due in late April or early May, and the placing of bids to begin only a few days after the upfront payments are made.

In response to a question regarding the requirements of the Omnibus Appropriations Act of 1997, P.L. 104-208, Title III, Sec. 3001(c) (1996), that "[t]he Commission shall commence the competitive bidding for the assignment of the frequencies described in subsection (a)(1) no later than April 15, 1997," DigiVox explained that the legislation can be interpreted to mean that the taking of the Forms 175 commences competitive bidding. To date, the Commission has never held an auction without first taking Forms 175. Therefore, it is the Forms 175 that commences the competitive bidding.

In response to a concern that DigiVox's proposed schedule does not leave sufficient time for the Commission to rule on petitions to deny after the replies are due, DigiVox explained that, as was the case with the C Block auction, there are not likely to be many petitions and that the Commission could have petitions to deny and replies due sooner by compressing other parts of the schedule, such as the time period for filing the Forms 600 or the time period from the filing of the Forms 600 to the release of the public notice accepting the applications for filing.

DigiVox also explained that the Commission can speed up the auction by moving to multiple rounds per day much more rapidly and by having higher minimum bid increments in the early part of the auction. In addition, although DigiVox prefers the auction to end on its own, if the Commission is running out of time it could, if it has to, use the end-of-auction procedures proposed by Dr. Harstad in Part III of his report, which was attached to DigiVox's opening comments. A reformatted and updated version of the report is included herein as Attachment 3.

Frequency Blocks and Market Areas

DigiVox explained that it intends to use the spectrum for a low-tiered, two-way mobile technology known as Personal Access Communication System ("PACS") for the purpose of providing competitive local loop services. A brief description of PACS prepared by Hughes Network Systems is included herein as Attachment 1. Ten MHz of spectrum in the form of two paired 5 MHz blocks, as explained by DigiVox at pages 3-4 of its opening Comments and pages 8-9 of its Reply comments, is needed for PACS technology. Pairing is critical, because full duplex operation would not work for voice transmissions in a spectrally efficient manner without pairing, and both voice and data services must be offered to be competitive. DigiVox is opposed to 15 MHz blocks because it is too much spectrum, and as a small business, DigiVox cannot afford to purchase more spectrum than it needs. In addition, having three blocks instead of two blocks promotes the Section 309(j) objective of offering licenses to as many different entities as possible, including small businesses, women and members of minority groups.

DigiVox explained that it is very much opposed to six 5 MHz blocks because it causes an inefficient auction as well as a chaotic post-auction market structure. It causes an inefficient auction because it forces bidders who need paired blocks to pay a premium to get those blocks, while at the same time it makes it easier for incumbents who have no need for the spectrum to block the business plans of new entrants by warehousing half of each channel pair. Thus, with 5 MHz spectrum blocks, incumbents would be able to prevent the use of 30 MHz of spectrum by acquiring only 15 MHz. It causes a chaotic post-auction market structure because the pairing will not be uniform, making it impossible for manufacturers to be able to develop cost effective equipment. Therefore, the result could be no equipment being manufactured, not unlike what happened with AM stereo. Pairing for auction purposes will result in a standard 40 MHz separation between base and customer units, thereby giving the manufacturers the standard they need to make equipment. Other highly successful services, such as cellular and PCS, rely on the pairing of channels.

DigiVox explained that it supports using the Major Trading Area ("MTA") definition of markets. MTAs represent a compromise between (i) the need to give the Commission the ability to promote the Section 309(j) objective of diversification of licenses and provide an opportunity for small businesses to participate and (ii) the need to keep the auction simple enough so that it can be completed in time to receive all monies on or before September 30, 1997. Nationwide or regional licenses limit the number of participants, and in particular squeeze out small businesses. Basic Trading Areas ("BTA") cause the auction to be too complicated to complete on time. In response to other representatives of small businesses at the January 14, 1997 meeting who were proposing Economic Area ("EA") licensing, DigiVox explained that it preferred MTA licensing so that the auction can be completed on time, but was not opposed to EA licensing if the Commission could complete the auction on time **without compromising the lead time from the release of the report and order to the upfront payment deadline.**

Bidding Credits

DigiVox stated that it supports the definitions of small business (average annual revenues under $40 million) and very small business (average annual revenues under $15 million) used for the broadband PCS F Block. DigiVox proposed for all frequency blocks a 25% bidding credit for small businesses, a 40% bidding credit for very small businesses, and an additional bidding credit of 5% for bidders who do not have any broadband CMRS spectrum in the market. DigiVox proposed the same attribution rules as those already codified in the CMRS spectrum cap rules. DigiVox explained that the higher bidding credits are needed because small businesses will not have the benefits of an installment payment plan or a set-aside. Attachment 2 is a report from Dr. Harstad showing that when taking the installment payment plans into effect, very small businesses received an effective bid credit of 49.1% and small businesses received an effective bid credit of 42.3% in the broadband PCS F Block. In the C Block, small businesses received an effective 56.7% bid credit. (Attachment 2 differs slightly from the version handed out at the January 14, 1997 meeting, because the earlier version incorrectly assumed the interest rate for C Block small businesses to be 5.71%.) In his report (Attachment 3), Dr. Harstad explains the benefits of using bidding credits, including how it encourages large businesses to come closer to bidding what the spectrum is actually worth to them. Attachment 4 is an unpublished paper, Rothkopf, Harstad and Fu, *Is Subsidizing Inefficient Bidders Actually Costly?* (Rutgers Univ., Sept. 1996), which was cited by Dr. Harstad in his report (Attachment 3). This paper provides empirical data supporting the use of significant bidding credits for small businesses rather than the use of set-aside spectrum.

DigiVox supports the use of unjust enrichment penalties for five years rather than the ten year period used for PCS. A ten year period was needed for PCS because the installment payment plan lasted ten years and the Commission used set-aside spectrum blocks. In the case of WCS, there will be no installment payment plan, and if the Commission does not have any set-aside spectrum, there will be no need for a ten year unjust enrichment period. A five year period, as was used for IVDS and other services, makes more sense because it will make it easier for bidders to attract investors.

Spectrum Caps and Number of Licenses

DigiVox explained that it supports including WCS spectrum in the calculation of the 45 MHz spectrum cap, which now applies to cellular, PCS and SMR spectrum. The spectrum cap is needed to avoid an undue concentration of licenses as mandated by Section 309(j). Moreover, all CMRS incumbents can obtain WCS spectrum in most markets, as there are very few markets now where any bidders would be disqualified from obtaining at least 10 MHz of WCS spectrum. Spectrum caps would prevent undue concentration at this stage of the industry's growth. In Appendix 1 to his report (Attachment 3), Dr. Harstad does an HHI analysis that demonstrates the need for including WCS spectrum in the 45 MHz spectrum cap. DigiVox noted that Dr. Harstad's HHI analysis has gone unchallenged in the record of this proceeding.

DigiVox also explained that it supports limiting to 98 the total number of CMRS and WCS licenses for which any entity may take advantage of small business bidding credits and

other designated entity benefits. Once an entity has received 98 licenses, it no longer needs special benefits to assist it in getting into business. It has achieved success, and the special benefits should be reserved for other small business newcomers. If the entity wants more licenses, it ought to be able to obtain them without bidding credits. Therefore, Section 24.710 of the Commission's Rules should be expanded to include WCS licenses, thereby promoting the diversity of licenses mandated by Section 309(j).

In support of both the spectrum caps and the limit to the number of licenses that can be obtained with bidding benefits, DigiVox pointed out that in the broadband PCS A and B Blocks auction, the top 3 bidders won 63% of the licenses and 67% of the population. The top 6 bidders won 77% of the licenses and 82% of the population. In the broadband PCS C Block auction, the top 3 bidders won 68% of the population and 24.4% of the licenses. The top 6 bidders won 78% of the population and 34.5% of the licenses. NextWave alone won 63 licenses, representing 105.8 million population (1990 Census). Therefore, the limits discussed by DigiVox herein are more than needed to avoid undue concentration of licenses.

Build Out Requirements

DigiVox explained that it is opposed to build out requirements. With PACS technology, for a small business to be successful, it must first build where there is the greatest demand and move on to other areas as cash flow permits. A particular set of build out requirements could cause undue hardship, thereby undermining the Commission's goal of providing an opportunity for success.

Very truly yours,

Eliot J. Greenwald

cc: Michele Farquhar, Chief, Wireless Telecommunications Bureau
D'Wana Speight, Wireless Telecommunications Bureau
Kathleen O'Brian Ham, Chief, Auctions Division
Jonathan V. Cohen, Auctions Division (on detail)
Walter D. Strack, Policy Division, Wireless Telecommunications Bureau
Evan R. Kwerel, Office of Plans and Policy
John R. Williams, Office of Plans and Policy
William E. Kennard, General Counsel
Peter A. Tenhula, Office of General Counsel
Victoria Phillips, Office of General Counsel
Catherine Sandoval, Director, Office of Communications Business Opportunities
Eric Jensen, Deputy Director, Office of Communications Business Opportunities
S. Jenell Trigg, Office of Communications Business Opportunities

Jackie Chorney, Office of the Chairman
Julius Genachowski, Office of the Chairman
Rudolfo M. Baca, Office of Commissioner Quello
David R. Siddall, Office of Commissioner Ness
Suzanne Toller, Office of Commissioner Chong
David W. Zesiger, Office of Advocacy, U.S. Small Business Administration

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ATTACHMENT 1

HUGHES
NETWORK SYSTEMS
A HUGHES ELECTRONICS COMPANY

HNS AIReach™ PERSONAL ACCESS COMMUNICATION SYSTEM

Dear Colleague,

The AIReach Personal Access Communication System (PACS) is a wireless wireline system! Consider the following attributes of AIReach PACS:

- 32 kbps voice coding that gives wireline quality voice
- 98% or greater radio coverage in the area served
- 1% grade of service to assure maximum throughput
- Typically 80 to 100 milli erlangs of traffic per subscriber

Now, combine these wireline-type service characteristics with the PACS network related benefits:

- PACS is designed to work with existing telephone switches using standardized interfaces which reduces network deployment costs
- PACS has a very simple architecture that builds on existing technology
- PACS provides a migration to higher speed fax and data services through either interworking functions or slot aggregation on the TDMA air interface
- PACS can be deployed with as little as 10 MHz of RF spectrum
- PACS equipment is very simple in design and small in size hence reducing capital as well as site costs

As these service characteristics and network related benefits converge in an AIReach PACS system, the PCS operator is in a position to offer a differentiated PCS service:

- A single PACS platform that provides local loop, pedestrian, neighborhood, and high speed communications service
- The ability to provide 10 times the traffic (80 to 100 me) to the subscriber compared to cellular type PCS systems (10 to 15 me)
- The ability to provide wireless local loop while maintaining the wireline voice quality
- The ability to offer higher speed wireless data to subscribers

For these reasons, HNS believes that AIReach PACS represents a unique opportunity for PCS operators competing in a crowded field. The enclosed briefing package describes the AIReach product in more detail. Please feel free to contact me if you need additional information. My phone number is 301-548-1251; my fax is 301-548-1245; and my E-Mail address is: VPATEL@HNS.COM.

Sincerely Yours,

Vinay Patel

Vinay Patel
Marketing Director

11717 Exploration Lane, Germantown, Maryland 20876 USA
Phone: 301-548-1251, Fax: 301-548-1245, E-Mail: VPATEL@HNS.COM

ATTACHMENT 2

Report on Bidding Credits for WCS Auctions

Ronald M. Harstad, Ph.D.

January 14, 1997

The issue of an appropriate level of bidding credits for the WCS auctions needs to reflect the requirement that the entire net price on each WCS license must be paid by September 30, 1997. A substantial part of the economic value of preferential treatments small businesses have received in the C and F block auctions stems from payment over ten years on favorable loan terms.

Here I present, for basis of comparison, a single number summarizing the effective rate of preferential treatment, or rate of effective bidding credit, when the combined roles of bidding credits and preferential loan treatments is taken into account. Small businesses will be "getting a better deal" in the WCS licenses, relative to the C and F blocks, only if the bidding credits are larger than these effective credits.

The effective bidding credit depends on both the preferential terms and the cost of capital faced by the business in question: the more a firm's cost of capital exceeds the interest rate offered by the FCC, the greater the benefits derived from the loan. (I outline the method of calculation at the end of this brief report.)

It is hard to know a firm's cost of capital exactly. For my baseline numbers, I will work with a standard of 18%, and then consider how much the rate of effective bidding credit varies with changes in the assumed cost of capital facing a small firm.

Most C block winners qualified for the most favorable terms,[1] which effectively offered a 56.7% credit. F block bidders qualified for four different effective rates, depending upon annual gross revenues.[2] Firms with revenues under $15 million were effectively offered a 49.1% credit.[3] Less tiny firms, but still with revenues under $40 million, were effectively offered a 42.3% credit.[4] Less small firms, but still with revenues under $75 million, were effectively offered a 23.5% credit.[5] Firms who did not qualify for that preferential treatment, but did qualify to bid in the F block, received an effective bidding credit of 19.3%.[6] All five of these calculations yield substantial effective rates of bidding credits, especially the first three.

For a simple indication of the sensitivity of these effective rates to the firm's cost of capital, I indicate how the effective rate would change if the cost of capital were as high as 20% or as low as 16%. For the most favorable C block terms, the corresponding rates are

---

[1] A 25% bidding credit, plus: 10% down payment, interest rate at the 10-year Treasury bill rate (my calculations used 6.75%, averaging the 7% rate most winners were granted with the 6.5% rate granted to those bidders whose licensing was delayed; the latter represent about half of the net revenue), interest-only payments for the first 6 years of a 10-year loan.

[2] I ignore here complications associated with different time periods and use of the maximum or average over the time periods. I also refer to bidders and firms interchangeably, ignoring issues of attribution.

[3] A 25% bidding credit, plus: 20% down payment, interest rate at the 10-year Treasury bill rate (all my F block calculations used 6.6%), interest-only payments for the first 2 years of a 10-year loan.

[4] A 15% bidding credit, plus: 20% down payment, interest rate at the 10-year Treasury bill rate, interest-only payments for the first 2 years of a 10-year loan.

[5] A 20% down payment, interest rate 2.5 points above the 10-year Treasury bill rate, interest-only payment for the first year of a 10-year loan.

[6] A 20% down payment, interest rate 3.5 points above the 10-year Treasury bill rate, for a 10-year loan.

60.03% (at a 20% capital cost) and 52.82% (at 16%). For the four classifications of F block bidders, in order, the effective rates become 51.8% (at 20%) and 46% (at 16%) for the smallest, 45.4% and 38.8% for the next smallest, 27.3% and 19.3% for those under $75 million revenues, and 23% and 15.2% for the largest bidders in the F block.

In these ranges, then, changing the cost of capital by 2 percentage points changes the effective discount rate by from just under 3 to just over 4 percentage points. High levels of bidding credits remain rather high, well above the credit calculation that is used by the FCC to determine "net revenue." In the WCS auction, net revenue will actually be an economically meaningful calculation.

I conclude with an outline of the method of calculation of these effective rates. In each case, the actual payments stream over the ten years implied by a set of preferential terms is calculated. The net present value of that payment stream is evaluated at the assumed cost of capital. The effective rate of bidding credit is then the difference between the net present value and the gross bid, as a percentage of the latter.

ATTACHMENT 3

Report of Ronald M. Harstad, Ph.D., on WCS Auctions

Summary of Arguments

My initial concern in this brief is with the meaning of an efficient outcome of the 2.3 GHz WCS auction. In sum, part I makes the following points.

1. Awarding each license to the bidder who is willing to pay the most is not an acceptable approximation for efficiency in the WCS auction.

2. A WCS license winner entering the high-tier CMRS market contributes little to the competitiveness of that market, and may make no contribution to efficiency.

3. LECs have great market power in local exchange markets. The burgeoning "one-stop shopper" entry into local exchange via reselling the LEC's local loop will do little to reduce the LEC's market power.

4. In contrast, there is a dramatic social gain from the increased competitiveness that results in a local exchange market for entry by a firm using a low-tier microcellular technology, such as PACS, which will not resell both origination and termination on any call.

5. The most strikingly adverse outcome of the WCS auction would be for CMRS incumbents to win licenses for the primary purpose of warehousing them, to prevent entry. This is contrary to 3 of 4 congressional objectives.

6. Acquisition of spectrum in excess of effective capacity is evidence of warehousing intent. This clearly arises somewhere before 45 MHz.

7. Less competitive CMRS markets will yield prices further above efficient levels. Hence, warehousing is prima facie evidence of unjust enrichment.

8. A CMRS and/or LEC incumbent should be presumed to be willing to pay more for a WCS license than its value to a WCS and/or LEC entrant.

9. Ensuring that new and innovative technologies are readily accessible and reaching an efficient outcome are compatible goals.

10. Efficiency calculations must involve broader considerations than simply the value-in-use of the radio spectrum segment.

11. Revenue received from licenses has an important efficiency component, since tax rates would otherwise be higher, and hence would distort economic behavior, with measurable inefficiencies resulting.

12. The belief that small firms will be inefficient spectrum users is based on the assumption that they will enter the same markets as CMRS incumbents, imitating the same technologies. This is clearly not true for many prospective bidders for WCS licenses.

13. The efficiency gains that result when subsidizing small firms with bidding credits forces larger competitors to bid more aggressively can outweigh negative consequences of small bidders' inefficiencies (if any).

14. The Regional Narrowband auctions clearly show subsidized bidders causing first-line bidders to pay more for the licenses they won; the extra revenue thus generated more than covered the cost of subsidies.

15. Research indicates that this should be a general, robust phenomenon. Efficiency is enhanced by subsidizing less-efficient bidders. The added revenue from unsubsidized bidders exceeds both the cost of subsidies and the pecuniary evaluation of the inefficiencies resulting when subsidized bidders win.

16. Small firms' purposes in entering the WCS auction are primarily pursuit of "in-use values" through innovative technologies. A rational speculator will find bidding in the WCS auction likely to be a less profitable option than injecting equity into a firm with negligible prior CMRS presence who won some D, E, F block licenses.

Below, after explaining the points just itemized in part I, I will turn my attention in part II to the implications for how the WCS auction should be conducted, as logical conclusions from an appropriate understanding of efficiency. These are:

17. Fighting warehousing of spectrum for anti-competitive purposes must be the FCC's highest priority.

18. The increased potential for warehousing has made the 45 MHz spectrum cap much more important than before. Indeed, the FCC should attempt to prevent CMRS incumbents with effective capacity from obtaining any further spectrum.

19. Since warehousing by incumbents is one identifiable usage of spectrum that *a fortiori* has less social value than any other, the FCC should consider license-specific bidding credits for non-incumbents.

20. Efficiency suggests that as small license areas as possible be auctioned, to allow efficient usage in as wide as possible a set of technologies. Given the 306-licenses constraint, this argues for offering 3 paired channels of 5 MHz each direction in each MTA.

21. The 153 licenses this implies will not create time difficulties. It does not mean processing anywhere near 153 payments: the experience of broadband auctions has been a concentration of licenses in the hands of a few firms.

22. Bidding credits of effective magnitude for small firms are essential to the hope for an efficient outcome. A small firm which purchased spectrum at the same price as a large firm would face a daunting disadvantage due to higher capital costs.

23. Since the Congressional mandate to collect payments by Sept. 30, 1997 prevents deferred payments, and deferred payments were a larger advantage for small businesses than bidding credits in C-block auctions, bidding credits substantially above those in the C block are called for.

24. Efficiency calls for splitting the 30 MHz in ways compatible with as many technologies as possible: DARS, low-tier microcellular technologies, such as PACS, and others.

25. Firms using low-tier microcellular technology, such as PACS, need paired channels. Simply licensing the 2.3 GHz spectrum in 5 MHz segments would yield a very serious inefficiency: a warehouser could tie up 10 MHz of spectrum while only buying 5 MHz. In so doing, he would prevent the use of the other half (the matching 5 MHz) by technologies requiring paired channels.

26. The extent of buildout which an efficient social planner would prefer varies substantially across the various technologies we know are vying for WCS spectrum. No build out requirements will accommodate them all.

27. Buildout requirements on blocks A-F ensure that primary spectrum uses are extended adequately to rural customers.

The third part of the brief points out that changes in the rules ought to be limited to those that do not change fundamental incentives of the current auction form. The Congressional time constraints are an insurmountable enemy of reasoned experimentation:

28. Significant changes in the form of the auction are unwise, and unneeded; there are tools the FCC can use more effectively within the current form to control the length of time the auction takes.

29. The current auction form is known to work, which cannot be said of alternatives available then or suggested now.

30. The FCC can speed up the auction by using more rounds per day, effectively, so long as the schedule is known, fixed, and unrelenting.

31. Minimum bid increments can be used much more effectively than in recent auctions to speed up conclusion.

32. A procedure is provided whereby the FCC can systematically end the auction within little over a day, without introducing the sort of inefficiencies that a single, first-price-like, final round would cause.

The fourth part deals with the most important use of the Congressionally limited time:

33. Congress has applied tight time pressure. The most important phase to resist shortening is the time from finalizing rules to requiring upfront payments.

34. There is plenty of time to announce final rules, still give firms enough time to get their funding arrangements settled, and finish the auction on time.

Part I: Interpreting Efficiency

1. Efficiency, meaning allocative efficiency, is in principle well-defined: an allocation of resources to households, to firms owned by households, and to public-sector agencies with well-defined resource-requirement tradeoffs, is efficient if there is no other allocation that would universally be preferred.

This definition is essentially useless outside theoretical models. So economists typically ignore possibly significant complications by assuming that an allocation can be considered efficient if it maximizes the sum of producers' and consumers' surplus. This definition is, however, only a step toward being operational.

Most auction theory papers, in a trend echoed by the FCC,[1] leap to a much stronger simplification: they assume that efficiency means awarding licenses to the bidders willing to pay the most for them.

With market concentration in any of the main affected markets, this simplification is never true. It was arguably an acceptable approximation at the time of adoption of the broadband auction rules, but only for two reasons: [i] cellular incumbents in an MTA were barred from bidding for 30 MHz PCS licenses, [ii] there were no PCS incumbents.

At the conclusion of the D, E, F block auction, there will be 5 to 8 CMRS incumbents in every market. Cellular and PCS incumbents have far different incentives in bidding for WCS licenses. Let us revert to the less heroic sum-of-surpluses measure and consider the relevant comparisons:

Scenario G (for "Good"): a firm with at most negligible current spectrum holdings wins a WCS license. It uses the spectrum to offer a new and innovative product. Due to limited price discrimination opportunities, most customers were willing to pay more for the class of service received than the price charges. Hence, both consumers' and producers' surplus increase.

Scenario NG (for "Not Good"): a CMRS firm with 30 or more MHz in an MTA wins a WCS license, to add to its spectrum capacity. It realizes that any new service offerings would be risky and would steal at least as many customers from its current offerings as from those of its current competitors. So, as anticipated before it bid, the firm simply adds the new spectrum to its capacity, and continues its present market offerings. The extra capacity is not really

[1] *Second Report and Order*, and this NPRM 96-441 at 18.

needed; it is being "warehoused" to prevent a firm that might have obtained that spectrum from entering the CMRS market.

The impact of warehousing is to keep prices, and therefore profits, higher than they would have been. Since prices after entry would still be above marginal costs, the increase in producers' surplus that results from warehousing is necessarily smaller than the decrease in consumers' surplus that results. As with a variety of exercises of market power, warehousing of spectrum is necessarily inefficient.

2. A WCS license winner becoming a new entrant in a CMRS market is vastly preferable to warehousing, but honestly accomplishes little in the way of effective increase in competitiveness. If there is no overlap in the cellular incumbents and the A-F block winners, the WCS license holder becomes potentially the 9th firm in the CMRS market, in addition to any SMR competitors. The WCS firm would be wildly optimistic, given last-mover disadvantages, to expect as large as a 10% market share. None of the several serious business analyses I have seen or learned about have pegged the break-even market share nearly as low as 10%. A WCS entrant that cannot reach break-even market share cannot have any lasting favorable impact on prices.

If there are fewer CMRS competitors, that will be because one or more of those firms decided it would be a stronger competitor with more capacity. That would be worse news for a WCS entrant.

3. The situation in the local exchange market is vastly different. Increased wireless market penetration has been almost exclusively customers adding communications services, with very little revenue loss to the LEC. The LEC has near-monopoly market power, subject only to approval from often ineffective regulatory agencies.[2]

We have just begun to see what appears to be substantial entry into retail telephone service markets. To the extent that consumers find some value in "one-stop shopping," the LEC does face the prospect of some loss of local exchange revenue. However, this does not lead to a loss of LEC market power. As the "one-stop shopping" firms are resellers of the LEC's local loop, the LEC will have just as much control over the pattern of local phone rates, via coordinated changes in its retail rates and its access charges.

4. *The WCS auction might present an opportunity to introduce some real competitiveness to the local exchange market.* Should a firm planning to introduce a low-tier microcellular technology, such as PACS, win a WCS license, it can

[2]Such oversight has historically been ineffectual in the sense of failing to increase consumers' surplus over levels expected with unregulated monopoly.

create a higher impact entry into local exchange (as well as competing in the CMRS market). Since low-tier microcellular technologies, such as PACS, offer landline sound quality, such firms can enter local exchange markets without being resellers of the local loop. Specifically, a PACS firm will not resell both origination and termination on any local call. If the access charge per call for the PACS firm to terminate via the local loop is the same as the access charge per call for the LEC to terminate via a PACS connection, then under weak assumptions, the access charge payments flowing from the PACS firm to the LEC will total approximately the same as the access charges flowing the reverse direction.

Thus an entrant using low-tier microcellular technology, such as PACS, notably reduces LEC market power. Appendix I offers examples of impact on Herfindahl-Hirschman Indices (HHI). Use of WCS spectrum creates very little reduction in HHIs for traditional high-tier CMRS markets, which are already rather low. Indeed, removal of the 45 MHz spectrum cap makes it very likely that HHIs will show greater market concentration after the WCS auction than before. In contrast, PACS entry into local exchange with a WCS license dramatically reduces an HHI that begins very high. This occurs even under very conservative assumptions about the market share the PACS firm can attain. Straightforward calculations show that the LEC will most profitably leave its prices unchanged even when undercutting by the PACS firm shifts numerous customers.

There is no single, universally accepted method for comparing the importance of reducing an HHI in one market (local exchange) from over 9,000 to around 6,000, relative to reducing an HHI in another market (CMRS) from perhaps 1,600 to 1,500. I use a simple measure designed to count more highly a given HHI reduction if the initial level showed more market concentration. *This implies that an entrant to local exchange who is not a reseller accomplishes an objective that is about* **18** *to* **125** *times as important as the greatest accomplishment that can be expected via WCS spectrum usage in high-tier CMRS markets.*

5. For WCS spectrum to be warehoused is sharply contrary to the Congressional mandate to attempt "the rapid deployment of new technologies, products and services." Warehousing is similarly adverse to "promoting economic opportunity and competition and ensuring that new and innovative technologies are readily accessible to the American people by avoiding excessive concentration of licenses and by disseminating licenses among a wide variety of applicants, including small businesses owned by members of minority groups and women." No other imaginable use of spectrum could be more contrary to "efficient and intensive use of the electromagnetic spectrum."

6. The FCC originally decided to make A/B and C block licenses 30 MHz each due to industry responses to the original NPRM. These responses showed a near consensus that potential bidders for the A and B block auctions believed 30 MHz to provide sufficient capacity for a provider to attain a favorable market share even in the most densely populated urban areas.

That was three years ago. Market penetration since has been within usual confidence intervals of geometric expansion. In plain English, demand has grown, but not significantly more than expected. However, there have been major strides in data compression capabilities in the last three years; 30 MHz can provide a capacity today that is a substantial multiple of capacity then (details vary with technology; some have expanded capacity 3- to 5-fold, others up to 10-fold or more). So it is beyond the pale to claim that a PCS provider's legitimate capacity needs approach anywhere near 45 MHz.

Considerable equipment modification is needed for cellular providers to use spectrum as efficiently as PCS providers. Until equipment changeover is complete, cellular carriers could require slightly greater capacity than a PCS provider needs. However, until changeover is complete, cellular carriers will be at a legitimate disadvantage in attracting new customers, and should expect market share diminution. In any event, it also stretches credibility to argue that a cellular carrier's legitimate capacity needs approach anywhere near 45 MHz.

In the near term, the natural and appropriate priority for a cellular incumbent or a PCS A, B, C block winner is shoring up its base. For a PCS firm, this means reaching a rapid conclusion of build out, and then market entry. For a cellular incumbent, this means rapid equipment refitting and acquiring the added sites needed to offer digital communications. For either to argue that more spectrum is needed to bring to fore plans for innovative technologies and services, that could not be offered without additional spectrum, is not credible in the least.

Thus demand for more spectrum by a PCS carrier holding about 30 MHz or more (or a cellular firm holding perhaps 35 MHz or more) is compelling evidence of warehousing intent.[3]

7. Warehousing spectrum incurs a cost (purchase price) in order to attain higher prices than would otherwise prevail. As such, it is the exercise of a degree of monopoly power, rightly considered to constitute unjust enrichment. In this sense, then (considering point 5 above), all four Congressional objectives mandate the FCC to attempt to prevent warehousing. The "need to balance

[3]Warehousing may well occur at lower capacity levels, but arguments for needed capacity might be envisioned at levels significantly lower.

conflicting objectives" that some have claimed when lobbying the FCC does not arise here.

8. None of the standard industrial organization models of concentrated industries fit the critical features of the CMRS market perfectly. It is reasonable, though, to believe that characterizations common to all these models may well apply to this industry.

Such a feature is the robust phenomenon that the value to a monopolist of maintaining its monopoly status exceeds the profit an entrant could obtain. This feature follows whenever total industry profit in a duopoly is less than the profit a monopolist could attain. In the simplest example, firms selling identical products with identical costs and quantity-setting strategies (the "Cournot" model), a monopolist would always be willing to pay *25%* **more** *to warehouse* a single license and maintain monopoly than the *most* a potential entrant would be willing to pay for that license.[4]

Faced with these conclusions, a CMRS incumbent is likely to dispute the identical-products assumption of the Cournot model. But there is little solace for any other conclusion in models of concentrated industries with differentiated products. Several standard models lead to very similar conclusions.[5]

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[4]Within the same model, suppose a CMRS market with 3 principal incumbents, and the other current providers doomed to insignificance. Further suppose that a potential entrant needs to acquire all three 10 MHz WCS licenses in this market to become a survivable threat to the three firms. Then, in equilibrium, each of the three firms is willing to pay up to 69% more for one of the 10 MHz licenses that the most any potential entrant could afford to pay.

[5]Suppose a CMRS entrant is deemed equally likely (or unlikely) to obtain customers from all incumbents. Then the most appropriate model is the Chamberlin model. It predicts the same results as the Cournot model above, only more striking: the percentages by which incumbents seeking to warehouse spectrum would be willing to outbid entrants are higher in the Chamberlin model.

The alternative assumption is that product differentiation takes the form of establishing market niches, and an entrant must find his own market niche. That is, the entrant will only take customers away from the "adjacent" incumbents—those who are targeting customers in a manner most similar to the approach which the entrant uses to differentiate his product. The basis model used to analyze such markets is called the "address" model (a nice exposition of all these models is in chapters 11 and 12 of Eaton and Eaton, *Microeconomic Theory,* 3rd Ed., 1996, Prentice-Hall; all calculations here follow exactly the steps in those chapters). To take one example, suppose an incumbent serves the two market niches adjacent to the intermediate market niche an entrant would find most profitable. Then the model implies that, to a close approximation, the affected incumbent is willing to pay about twice as much as the entrant in order to warehouse the WCS license that would otherwise be used to enter this intermediate market niche. This approximation is relatively unaffected by substantial changes in the total number of CMRS incumbents.

Notice that it implies the following. Suppose three WCS licenses are being offered in this MTA. Suppose the bidder with the highest value for one of the WCS licenses here intends some unrelated usage (e.g., DARS). Then, if this CMRS market exhibits even a slight first-mover advantage not captured by the address model, the affected incumbent is willing to purchase and warehouse *both* of the

I conclude that auction rules which make no attempt to prevent warehousing, beyond maintenance of the 45 MHz spectrum cap, are likely to yield the **least efficient outcome** *possible.* All the spectrum that cannot be put to uses unrelated to CMRS, at a risk-adjusted rate of return far in excess of that available in CMRS markets, is likely to be warehoused. All that will be accomplished is the prevention of entry into these markets, and movement toward *less* intensive use of the electromagnetic spectrum.

9. Several comments on auction NPRMs have pronounced any new and innovative technology plans by small firms to be necessarily inefficient uses of spectrum.[6] This leads them to claim that the objectives of making new technologies readily available and of achieving efficient spectrum usage are in conflict. An appropriate understanding of efficiency shows how transparently fallacious these pronouncements are. These goals are often harmonious; for one example, both objectives are served by attempts to avoid warehousing. A more direct example: given uniform prices or limited price discrimination, the profitable introduction of a new communications service via an innovative use of spectrum necessarily increases the producer's surplus reaped by its developer and also the consumers' surplus attained by its customers.

Considering the devastating consequences of warehousing, efficiency calls upon the FCC to accept the highest bid submitted by a firm intending an innovative use even when a rival bidder intending to warehouse the spectrum being licensed bids 50-100% higher.

10. The methods economists all too predominantly use to analyze microeconomic policy issues ignore the efficiency impacts of changes in government revenue. These methods predominate in virtually all of the comments in all of the dockets relating to spectrum sales. The key relevant feature of such methods is an assumption that a change in the amount paid when a public resource is privatized is a pure transfer, with no efficiency consequences.

That assumption is appropriate in the realms of "high theory," where lump-sum transfers can serve the public fisc. It is wholly inappropriate in an economy that relies on excise taxes, income taxes, and payroll taxes to support that part of its expenditures which are not covered by debt finance.

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remaining licenses, and to pay slightly more for each of them than a potential entrant could afford to pay for either.

While these results do not cover every possible sort of competition in a concentrated industry, the fact that such diverse models all point to the same conclusion does create a natural presumption that a CMRS incumbent may often be willing to pay more to warehouse a license than the most a potential entrant to that market would be willing to pay.

[6]Most notably US West comments in docket WT 96-59, April 15, 1996.

Conclusions reached by such methods ought to be presented with serious caveats, and the authors know better than to blithely proceed without pause.

11. Imagine that there is a change in auction procedures which the FCC could adopt that would result in a $1 billion increase in revenue. This change could allow the federal government to collect $1 billion less in taxes. All the taxes governments in the U.S. use distort behavior, as individuals' and firms' behavior change at least somewhat in an effort to reduce their tax liability. The result of these behavior distortions is that taxes cost the economy more than the revenue they collect.

Every reasonably well-trained economist has been exposed to the considerable literature attempting to estimate the size of this "excess burden" of taxation. Given the enormity of the task, and the frequency with which tax regulations are changed, it is unsurprising that the scholars working in this area have not reached a consensus.

Numbers proposed have ranged from 14% to 333%.[7] Virtually all of the scholars contributing to these studies would agree that 33% is a conservative estimate of the excess burden of federal taxation.

This implies that a $1 billion tax cut, or a $1 billion tax increase prevented, effectively makes Americans $1.33 billion richer. Subtract the extra $1 billion that winning bidders paid for the spectrum, and we find that the economy is better off by $0.33 billion dollars because of the extra revenue brought in by the FCC.[8]

The 33% efficiency gain from added auction revenue assumes that all the added auction revenue goes into tax relief. If some of it goes into debt

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[7]These extremes come from Edgar Browning, *Journal of Political Economy*, 1976, and Martin Feldstein, "What the '93 Tax Increases Really Did," *The Wall Street Journal*, October 26, 1995, p. A22.

[8]Rest assured that no magic wand is being waved. At the level of individual transactions, here is what is happening. A worker who is in a 40% tax bracket would decline an offer to work overtime at $15 an hour if the leisure time that would be given up to work overtime is worth more than $9 an hour to her. Given the firm's offer of the overtime wage, we know that the value of the work is at least $15, perhaps more. A transaction that would yield a gain from exchange on the order of $6 does not occur due to the tax rate.

While that seems a small loss, such situations occur millions of times a day. Some similar situations involve large sums. Suppose a small firm offers an individual 15% for a $1 million loan. If she is in a 43% tax bracket, to decide she considers whether the after-tax rate of return, 8.6%, is far enough above the return she is currently getting on $1 million invested in municipal bonds to justify the added risk. Again, the economy faces this sort of choice a million times a day. In some cases, a 43% tax bracket drives the after-tax return low enough that it does not quite justify the added risk. Clearly, the funds are more valuably invested in the firm. A small reduction in tax rates can attain these efficiency gains for those cases for which the after-tax return came close to justifying the risk.

reduction, our best estimates are that the efficiency gain is a much larger percentage.[9]

12. Some major telecommunications firms seem to deride small firms as necessarily inefficient users of spectrum (again the US West comments on the D, E, F block rulemaking are a prime example). This strikes me as highly presumptuous. In particular, I suspect that the presumption large firms make is that small firms will be unable to achieve capacity utilization rates which the large telecommunications firms attain. It bears observation that this is the presumption that AT&T made about MCI and Sprint in the 1980s.

There are two significant situations in which the presumption is likely fallacious. One is when large firms warehouse spectrum. For example, suppose a large firm holds 40 MHz of spectrum. There is some point past which added spectrum will not lead to an added effective capacity which could attract more customers. While I suspect it is lower, assume for the sake of discussion that this point is at 30 MHz. If this large firm and a small firm holding 10 MHz of spectrum are correspondingly adept at attracting and keeping customers, the large firm will then have three times the small firm's market share. If the large firm has brand-name cachet or other inimitable marketing and customer service advantages, it may attain more than three times the small firm's market share. But it has to go past four times to be a more efficient user of spectrum.

The second situation arises when the small firm applies spectrum to a new and innovative use. Probably, it is initially a monopoly supplier of the new service, and will continue to enjoy a first-mover advantage after competitive firms supply a very similar service. Again I would consider the number to be high, but suppose that effective capacity for serving the entire CMRS market is 105 MHz. In most major urban areas, by the completion of the WCS auctions, there will be on the order of 210 MHz capacity among the large firms supplying CMRS (cellular: 50, licensed PCS: 120, SMR: 10, WCS: 30 MHz). Thus, CMRS suppliers will presumably be using only 50% of their spectrum allocation efficiently.

Thus, a small firm acquiring 10 MHz for an innovative usage need only reach the point where 5 MHz would be inadequate to serve its customers, in order to be a *more efficient* user of spectrum (above 50%).

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[9]Cf. Feldstein, *Journal of Public Economics*, 1986. However, Congress may not be able to resist added spending when the FCC auctions bring in $1 billion in added revenue. The sort of example a cynic might construct would have 70% of the added revenue go into some combination of debt and tax relief, 20% go into somewhat wasteful added spending that has a social value of $0.95 for each dollar spent, and 10% of the money completely wasted by Congress (i.e., with no social value whatsoever). Then if the particular combination of debt and tax relief happened to average an excess burden of 73%, which is not at all unreasonable, once again the overall effect of the added revenue is to yield a 33% efficiency gain.

13. Nonetheless, grant the large firms their questionable presumption: suppose small firms are less efficient users of spectrum. It can nonetheless make clear economic sense to offer small firms bidding credits. There can be no doubt that small firms, efficient users of spectrum or not, are disadvantaged competitors in bidding for spectrum. It is sufficient to realize that network buildout will be financed by small firms at a much higher cost of capital to conclude they are disadvantaged.

A first-line bidder (a large firm) facing at most a couple other first-line bidders, with the rest of his competitors disadvantaged by a high cost of capital, rationally takes advantage of this. On average, the price he pays for a license won is lower than if all of his competitors had as low a cost of capital as he has, and thus were able to compete more aggressively.

If small firms are given bidding credits, this reduces their disadvantages somewhat, making them more effective competitors. In the auction form used so far, whenever bidding credits allow a small firm to compete at higher gross bid levels than all but one of the first-line bidders, the bidding credits have served to increase the price paid by the winner.

This understates the likely revenue gains from large firms facing disadvantaged bidders who are subsidized. Competitive gross bids by small firms also make large firms switch the licenses on which they bid. The effect is to make a given number of large firms compete against each other on a larger set of licenses.

14. The Regional Narrowband auction in 1994 provides an illuminating example. Designated bidders were given preferential treatment on all bands, including larger preferences on bands 2 and 6. Ayres and Cramton[10] analyze this auction round-by-round. They find a compelling case that designated bidders were able, because of bidding credits and installment payments, to compete against eventual winners past the prices where the final losing first-line bidder on particular licenses ceased competing. Ayres and Cramton use this information to calculate a lower bound on the total added revenue the FCC obtained as a result of designated bidders driving up prices on licenses first-line bidders won. *This added revenue more than paid for the subsidies and preferential loan arrangements on licenses designated bidders won.*

15. Ayres and Cramton do not resolve the question of whether the bidding credits led to a more efficient outcome in the Regional Narrowband auction. To do this would require information on the extent of inefficiencies (if any) in

[10]Ian Ayres and Peter Cramton [1996], "Deficit Reduction Through Diversity: How Affirmative Action At the FCC Increased Auction Competition," *Stanford Law Review*, 48, 401-53.

spectrum usage as a result of awarding several licenses to designated bidders. This data is not available, and may never be.

A full efficiency calculation can be performed in the theoretical model of Rothkopf, Harstad and Fu (below, "RHF"), for the simple auction (by sealed bidding) of a single contract.[11] Their model is presented in the context of bidding by potential sellers for a contract to supply a single product or service, such as construction of a public building. The results fully carry over to an auction context where bidders are seeking to buy an asset, the context I will use in describing their results.

The RHF model assumes, quite legitimately, that no bidder knows for certain what the license's value in use will be. To make the analysis tractable, it assumes that whatever the license value turns out to be, it will be the same for every first-line bidder; for every designated entity, the license value will be some D% less than its worth to a first-line bidder (e.g., 25% less). All bidders are assumed to know D. Each bidder conducts its own market analysis to arrive at an estimate of license value. To focus on differences in value-in-use across the bidder types, rather than in market analysis accuracy, RHF consider the case where no bidder is systematically more accurate than others in its market analyses.[12]

The impact of bidding credits naturally depends on how many first-line and how many designated entities compete, on how severe the designated entities' disadvantage is, and on how accurately bidders' market analyses predict license values. Only for values of these parameters that seem to be quite far-fetched do bidding credits generate net inefficiencies, given that 33% of added revenue constitutes an efficiency gain (the benchmark for all of RHF's analysis).

Granting bidding credits leads first-line bidders to respond by bidding more aggressively whenever designated entities have a chance of winning. For an extremely wide class of parameter values, bidding credits pay for themselves, in that the cost of bidding credits (i.e., the difference between gross bids and net bids in the event a designated entity wins) is less than the added revenue due to more aggressive bidding by first-line bidders. For almost as large a class of parameter values, this excess of added revenues from first-line bidders, beyond that needed to cover the cost of bidding credits, remains more than 3 times the monetary size of the inefficiencies that result from awarding the license to the lower-valuing designated entity some fraction of the time. In other words, the

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[11]Michael H. Rothkopf, Ronald M. Harstad and Yuhong Fu, "Is Subsidizing Inefficient Bidders Actually Costly?" unpublished, RUTCOR Research Report, Rutgers University, September 1996.

[12]Two further restrictions allow RHF to calculate equilibrium impacts of bidding credits: that estimating errors have extreme-value distributions, and that bidders choose bidding markdowns that produce bids proportional to their license value estimates.